Why should we and how can we make the design process more complex?

A new look at the systems approach in design

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This article is from the IDE-25 year Jubilee book "Shaping Futures" ed. Marianne Lie Berg, published by the Oslo School of Architecture 2009. You can order the book at www.aho.no.

A complex world

The world is becoming an increasingly complicated place to relate to. This applies to many fields: politics, economics, culture and information. And design is no exception. There are ever higher demands for more knowledge, following trends and the capacity for interdisciplinary collaboration. The context designers operate in is becoming increasingly composite.

Rules and regulations are one manifestation of globalisation, along with the increasing focus on the consequences manufacturing and consumption have for the environment, economic systems, users and our ecological footprint. The Fair Trade movement is also gaining influence. The increasing complexity of the actual process of producing a product is the result of the fact that a growing network of stakeholders has to be consulted – both within the customer's organisation and also through regulations, customer surveys, focus groups and user involvement. The stakeholders constitute a field of intentions that are at times contradictory.

Performance and design

In this kind of situation, it is increasingly important that designers are trained to operate within these fields of interest. In the past, responding to conflicting interests was regarded as a compromise – a negative for designers. Nowadays we talk of negotiations as something positive, saying that design is generated in this field of interaction and negotiation. The end result is not necessarily any less innovative. By contrast, a responsive attitude to our surroundings and the various stakeholders can promote creativity. This attitude has manifested itself in new ideas and the debate concerning *performance-oriented design* (Hensel & Menges, 2008), which probably first appeared within architecture. *Performance-oriented design* is a new concept that has redefined the relationship between artefact and function. Whereas before it was regarded as a purely causal relationship, *performance-oriented design* sees the process as more complex and interactive. Function is no longer

regarded as a singular parameter, but as a field of relations. The interplay between artefact and environment affects both the environment and the design. The resulting design intention from such an approach is an ambition to juggle far more forces and variables and relating to microclimatic factors, sustainability, sensory effects, spatial parameters, etc. In this way, design gets involved in its surroundings in an active, innovative and creative way.

Systems thinking revitalised

Other manifestations of the increasing need to be able to handle ever more complex problems is the renewed interest in systems thinking we are witnessing in several areas. Systems thinking in design was introduced by Christopher Alexander back in 1964 (Alexander, 1964). His work made a valuable contribution to the dawning understanding of the inherent complexity of objects. By analysing everyday objects, such as a teapot, he demonstrated the infinite complexity of these seemingly simple objects. In the 1960s and ’70s, systems thinking was dominated by a mechanistic approach. The inner workings of systems was understood on the basis of cause-and-effect models, and systems were defined by their borders and by a hierarchical order among systems and sub-systems (Skyttner, 2005). Today’s new systems-oriented approach is more concerned with understanding systems as fields of relations, as opposed (se kommentar) to defining borders and hierarchies. This provides a more holistic approach. This kind of approach is better suited to tackling complex and at times chaotic, unsurveyable problems and fields. One example of this kind of process is the Deichmanske Media Stations project (presented on page 178.). This acknowledgement has led to the growth of a new profession called systems architecture or “Systems Architecting” (Rechtin, 1999). We find systems architecture in management (Maier & Rechtin, 2000), in politics (Mariussen & Uhlin, 2006) and in engineering (Størdal, 2003). NATO uses the term systems architecture in its project management system called NAF, which stands for *NATO Architectural Framework*.

The name systems architecture is partly inspired by the computing term systems architecture, but it is important to distinguish between these two applications of the same expression, although they do partially overlap. Whereas systems architecture in computing describes the structural composition of systems, we use the term to describe a practice. The term refers to the architect’s supposed ability to handle very complex problems, such as fulfilling multiple conflicting functions, financial limitations, aesthetic requirements, cleaning and maintenance needs, the need for landmark buildings, etc., in a holistic, synthesising way. Design inspires

other areas too, such as management, in that people recognise that design thinking has a lot of potential (Boland & Collopy, 2004). Discussion is innovative and not afraid to tackle difficult, vague concepts. For example, Karl E. Weick introduces the term “Thrownness” (Weick, 2004). Derived from Heidegger’s “Geworfenheit”, it describes how we are surrounded by the tasks we are trying to resolve. He compares this to the task facing emergency teams in major catastrophes. It is impossible to fully predict the effect of one’s actions. Not doing anything also has an effect. The effect can only be fully understood retrospectively. In this kind of situation, you need a holistic approach, intuition and the ability to improvise and synthesise, which are typical qualities of designers. Without going so far as to claim that designers would make excellent emergency team leaders, the parallels are nevertheless apparent. Bolan & Collopy, whom we mentioned above, suggest processes for open planning, tolerance for ambiguity, and operating with several models simultaneously over a period of time in the design process, thus reducing the need for coordination. The role of the systems architect is complemented by traditional roles that are more fragmenting, fact-oriented and controlling, similar to the traditional project manager role or engineers.

What about design?

Ironically, this trend has largely been overlooked within the various fields of design. While other professions and disciplines are beginning to nurture and hone systems architecture, there is little discussion within design (with a few notable excerptions) concerning systematic development of our ability to synthesise extremely complex fields of problems. Our ability to resolve complex problems is taken for granted and thus not consciously further developed. So as not to waste this golden opportunity for interdisciplinary dialogue and to assume a role where design really can play a decisive part in resolving very difficult and important problems, we ought to participate in the development of systems architecture as a discipline and practice.

The Institute of Industrial Design (IDE) has been teaching systems-oriented design for several years, initially through our Designing Time courses, and later through the courses in systems thinking. Examples of the results achieved by these courses are Sturla Godøy’s capsules for cloning trees ECO CAP (presented on page …) and Balder Onarheim’s and Pål Espensen’s cookware (presented on page …). ECO CAP encompasses holistic evaluations of economic and social factors in rural village societies and tries to engage the grass root in production of seedlings and planting trees as an alternative to leaving this to large, centralised organisations. The project includes assessments of logistics and production, execution and discussions

concerning getting the local population involved in improving their own situation. It is based on old techniques and aims to modernise them in a low-tech way, so they are accessible to large population groups. Onarheim and Espensen's cookware project demonstrates an original systems-oriented process developed to become a complete process tool. The result is a product that is far more thoroughly thought through and with much more attention to detail than usual. It encompasses many assessments, including cooking culture, observations of cooking in private homes, social and cultural factors and a very advanced functional analysis. These two very different projects show that a systems-oriented approach can be used in every conceivable kind of design project.

In this light, the design process ought to be more involved in interdisciplinary collaboration and in difficult, complex problems seen from the designer's own point of view: The capacity for holistic thinking and synthesis is nurtured through visualisation and creativity. Design students should be trained for real life and to tackle the multitude of very complex and important problems the world is facing.

As mentioned above, a holistic view, intuition and the capacity for improvisation and synthesis are typical qualities of designers. But how do we approach this as a field of knowledge? We need models for the design process that encourage these qualities. We need research into practice that systemises these qualities. The idea of a hybrid design process (Sevaldson, 2005) and the concept of Rich Design Space (Sevaldson, 2008) are attempts at introducing new models of this nature. The models come up with concrete proposals for how practice can be changed to work in more complex information fields on the one hand and to be able to cope with more complex problems on the other. Importance is attached Emphasis is put on ? to the actual physical, social and virtual space where the design process takes place. The design of this space affects how much and what information the designer has access to at the different stages of the design process. By actively changing this space, the design process will also change. Dramatic changes in the space will result in switches that accelerate the process and send it off in a new direction. These models are not the result of academic theorising in ivory towers, but have emerged as the outcome of research through design practice. In this kind of research, theories are hatched in close relation to practice, and practice is developed in close relation to theory. So far, we have only glimpsed the contours of the potential and importance of this kind of research. One example is the installation series "Barely" that I have worked on with the composer Natasha Barrett. The design process is

analysed and described in an article detailing a more complex design practice (Sevaldson, 2008). The process leading up to the final installation takes place in a number of changeable "design spaces", and moving between these spaces triggers switches in the process. Another example is the development of *performance-oriented* design in the studio course Membrane Spaces. Here new membrane constructions are developed in relation to microclimatic conditions. This research takes place through a design practice that tackles multiple effects and factors. (Hensel & Sevaldson, 2008) illustration page ….

Conclusion

Modern systems thinking, which has moved beyond the mechanistic models of previous eras, is well suited to one of the central roles of the designer: synthesising complex problems by shaping objects. We need new methods to meet the increasing complexity of the problems we face. The systems approach is seen more as practice based on experience than theoretical knowledge, and the capacity to handle complex problems requires training and practice as a skill rather than prescriptive procedures and theories. This is ideal for our project-oriented approach in design studies. We must understand the reasoning as to why we need to hone our ability to tackle increasingly complex problems Sentence is misunderstood it claims that the arguments are clear and obvious. How to go about doing this is also beginning to take shape. Through practice-based research and development, the foundations can be laid for design education for a new generation of designers who will be given both the knowledge and practice to be able to handle the increasingly demanding challenges we will encounter in the future. This kind of research can be done in and outside the studio. This is a case of research based on teaching and teaching based on research.

Several studio courses at the Oslo School of Architecture and Design (AHO) have addressed this field over the last seven years. The pictures show examples from different student projects within a systems-oriented approach to design.

Alexander, C. (1964). *Notes on the Synthesis of Form*. Cambridge, Massachusetts: Harvard University Press.

Boland, R. J., & Collopy, F. (Red.) (2004). *Managing as Design*. Stanford: Stanford University Press.

Hensel, M., & Menges, A. (Red.) (2008). *Form Follows Performance Zur Wechselwirkung von Material, Struktur, Umwelt* (Vol. 188). Aachen: Arch+ Verlag Gmbh.

Hensel, M. & Sevaldson, B. (2008). Membrane Spaces. www.membranespaces.net

Maier, M.W. & Rechtin, E. (2000). *The Art of Systems Architecture*. Boca Raton: CRC Press.

Mariussen, Å. & Uhlin, Å. (Red.) (2006). *Trans-national Practices, Systems Thinking in Policy Making.* Stockholm: Nordregio.

Rechtin, E. (1999). *Systems Architecting of Organisations: Why Eagles Can't Swim*. Boca Raton, Florida: CRC Press LLC.

Sevaldson, B. (2005). *Developing Digital Design Techniques*. Oslo: Oslo School of Architecture and Design.

Sevaldson, B. (2008). Rich Research Space. *FORM akademisk, 1*(1).

Skyttner, L. (2005). General systems theory: problems, perspectives, practice. Hackensack, N.J.: World Scientific.

Størdal, J.-M. (2003). *Systemarkitektur– kunsten å utvikle komplekse systemer.* Paper presented at the CIMI2003, Enköping, Sweden.

Weick, K. E. (2004). Designing for Thrownness. In R.J. Boland & F. Collopy (Red.), *Managing as Designing*. Stanford: Stanford University Press.